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10/756,829

01/14/2004

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EXAMINER

MEMULA, SURESH

ART UNIT

PAPER NUMBER

2825

MAIL DATE

DELIVERY MODE

09/06/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

**Application No.**

10/756,829

**Applicant(s)**

SOCHA ET AL.

**Examiner**

Suresh Memula

**Art Unit**

2825

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 18 June 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-7, 10 and 11 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7, 10 and 11 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 January 2004 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 6/18/07; 4/11/06.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_.

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**DETAILED ACTION**

This FINAL office action is a response to the amendments and remarks filed on 06/18/2007. The remarks are not persuasive; therefore, the rejections based on the prior art of record, Liebchen, are maintained. Claims 1-7 and 10-11 are pending, of which claims 10 and 11 are reinstated and are rejected on the same basis as similarly recited claims 1 and 2, respectively.

***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. **Claims 1-7 and 10-11 are rejected under 35 U.S.C. 102(e)** as being anticipated by US Pub. No. 2002/0062206 to Liebchen (Liebchen).

3. As to claim 1 and similarly recited claim 10,  
defining a transmission cross coefficient ("TCC") function (Paragraph 0009) determined in accordance with an illumination pupil (Abstract; Paragraphs 0007, 0009; FIG. 1B) and a projection pupil (Abstract; Paragraphs 0007, 0009; FIG. 1B) corresponding to an illuminator (Abstract; Paragraphs 0009, 0011; FIG. 1B);

representing at least one resolvable feature of a mask to be printed on the substrate (Paragraph 0007, 0026, 0240-0241, 0245, 0254) by at least one impulse function (Paragraphs 0007, 0066, 0240); and

creating an interference map (Abstract; Paragraphs 0001, 0003, 0012) of a predetermined order (Abstract; Paragraphs 0009, 0019) based on the at least one impulse function (Paragraphs 0007-0009, 0066, 0240) and the TCC function (Paragraphs 0003, 0007-0009), wherein the interference map represents the at

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least one resolvable feature to be printed on the substrate (Paragraph 0007, 0026, 0241, 0245, 0254) and areas of destructive interference (Paragraphs 0001, 0003, 0243).

4. As to claim 2 and similarly recited claim 11, placing an assist feature in the mask corresponding to the areas of destructive interference map (Paragraph 0254).

5. As to claim 3, wherein the assist feature is non-resolvable (Paragraph 0254).

6. As to claim 4, wherein the interference map models light intensity incident on the substrate (Paragraphs 0003, 0017).

7. As to claim 5, further comprising placing at least one assist feature on an area of the mask (Paragraph 0254) corresponding to an area on the interference map having a light intensity of a predetermined level (Paragraphs 0001, 0003, 0212, 0240, 0251, 0253-0254) corresponding to the areas of destructive interference (Paragraphs 0001, 0003, 0243).

8. As to claim 6, wherein the predetermined level corresponds to a resolvable light intensity (Paragraphs 0001, 0003, 0254).

9. As to Claim 7, wherein the interference map represents change in light intensity incident on the substrate (Paragraphs 0001, 0003, 0017).

***Response to Applicant Remarks***

10. The applicant states Liebchen does not teach:
- (a) “representing at least one resolvable feature of a mask to be printed on the substrate by at least one impulse function”; and
  - (b) “creating an interference map of a predetermined order based on the at least one impulse function and the TCC function”.

**Examiner’s response:**

11. **Regarding (a) and (b):** Liebchen teaches creating an aerial image of a mask (Abstract; Paragraphs 0001, 0003, 0012), i.e., interference map, the aerial image is then used to form an image on a resist (Paragraph 0001) and the resist is developed to form a patterned substrate (Paragraph 0001). Liebchen teaches in order to create an aerial image a transmission cross-coefficient (TCC), which captures all the effects of the lithographic projection apparatus (Paragraph 0009), must be pre-calculated (Paragraphs 0003, 0009), i.e., creating an interference map based on TCC function. Furthermore, Liebchen teaches features to be imaged (Paragraph 0010), i.e., at least one resolvable feature, are periodic in space resulting in a large TCC (Paragraph 0010). Accordingly, Liebchen teaches spectral basis arithmetic operations (Paragraphs 0018, 0055) are used to approximate the TCC (Paragraphs 0018, 0053-0055; FIG. 4), wherein the spectral basis operations include a incomplete Gamma-function represented by the Delta-function:  $\Delta(\alpha, \chi)$  (Paragraph 0066). As is known in the art the Delta-function is a normalized impulse, i.e., impulse function.

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**Conclusion**

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

13. A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Suresh Memula whose telephone number is (571) 272-8046. The examiner can normally be reached on M-F 8am-4:30pm EST. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack Chiang can be reached on (571) 272-7483. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

15. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Suresh Memula  
Art Unit 2825  
August 27, 2007

PAUL DINH  
PRIMARY EXAMINER

